Claims

[c1]   1. A method of processing a run of workpieces, the method comprising the steps of:

providing a database comprising subgroups of data representing characteristics from previously processed workpieces;

selecting a first subgroup of data having characteristics that satisfy a predetermined criteria;

determining processing conditions for a processing tool corresponding to the first subgroup of data;

processing the run of workpieces with the process tool using the determined processing conditions; and

measuring the run of workpieces according to a sampling rate determined from the first subgroup of data.

[c2]   2. The method of claim 1, wherein the characteristics include characteristics of the workpiece.

[c3]   3. The method of claim 1, wherein the characteristics include characteristics of the process tool.

[c4]   4. The method of claim 1, wherein the step of selecting a first subgroup of data includes the steps of:

applying a set of rules to the database such that each

rule generates a unique subgroup of data, wherein the rules are ordered according to a confidence level; and determining a subgroup of data of at least a minimum size that yields a highest confidence level among all of the rules.

[c5]   5. The method of claim 4, wherein the sampling rate is determined from a capability ratio calculated based on the rule used to generate the first subgroup of data.

[c6]   6. The method of claim 5, wherein, after processing, the run of workpieces is tagged with the rule used to generate the first subgroup of data.

[c7]   7. The method of claim 1, wherein the run of workpieces comprises a lot of semiconductor parts and the measuring step comprises a metrology process.

[c8]   8. An advanced process control (APC) system, comprising:
a data analysis system that determines a set of conditions for a manufacturing process based on a subgroup of data identified from a historical database, wherein the subgroup of data is identified according to a selected rule;
a tagging system that associates a tag containing the selected rule to each product lot subjected to the manufac-

turing process; and

a sampling optimization system that examines the tag for each product lot processed and determines a metrology sampling rate based on the selected rule.

[c9] 9. The APC system of claim 8, wherein the selected rule generates a subgroup of data of at least a minimum size that provides a highest possible confidence level for each of a set of rules.

[c10] 10. The APC system of claim 9, further comprising a rule ordering system that orders the set of rules based on historic capability data for product lots processed with each rule.

[c11] 11. The APC system of claim 9, further comprising a rule ordering system that orders the set of rules in real time by evaluating capability data for each rule using metrology data.

[c12] 12. The APC system of claim 8, wherein the sampling rate is determined from a capability ratio Cpk calculated based on the selected rule.

[c13] 13. The APC system of claim 12, wherein the Cpk is further calculated based on factors selected from the group consisting of: a process tool, a process, technology, part number, level, mask and operation.

[c14]   14. A method for optimizing metrology sampling rates in an advanced process control (APC) application, comprising:

calculating capability ratios (Cpk) for a product processed by each of a plurality of rules within a single APC process, wherein each Cpk calculation is based on an associated rule;

calculating sampling rates for each calculated Cpk;

processing a run of the product using a selected rule;

tagging the run of the product after processing with the selected rule; and

determining a metrology sampling rate for the run based on the selected rule.

[c15]   15. The method of claim 14, comprising the further steps of:

processing a second run of the product using a second selected rule;

tagging the second run of the product after processing with the second selected rule; and

determining a metrology sampling rate for the second run based on the second selected rule.

[c16]   16. The method of claim 14, wherein the selected rule is selected from a set of ordered rules that identify subgroups of data from a historical database.

[c17] 17. The method of claim 16, wherein the selected rule generates a subgroup of at least a minimum size that yields a highest possible confidence level.

[c18] 18. The method of claim 16, comprising the further step of reordering the set of rules based on historic capability data for product processed with each rule.

[c19] 19. The method of claim 16, comprising the further step of reordering the set of rules in real time by evaluating capability data for each rule using metrology data.

[c20] 20. The method of claim 14, wherein the Cpk is further calculated based on factors selected from the group consisting of: a process tool, a process, technology, part number, level, mask and operation.

[c21] 21. A program product stored on a recordable medium for optimizing an advanced process control (APC) system, comprising:
means for determining a set of conditions for a manufacturing process based on a subgroup of data identified from a historical database, wherein the subgroup of data is identified according to a selected rule;
means for associating the determined set of conditions to a product lot subjected to the manufacturing process; and

means for examining the associated determined set of conditions for the product lot to determine a metrology sampling rate.

[c22]   22. The program product of claim 21, wherein the associating means includes tagging the selected rule to the product lot.

[c23]   23. The program product of claim 21, wherein the selected rule generates a subgroup of data of at least a minimum size that yields a highest possible confidence level for each of a set of rules.

[c24]   24. The program product of claim 23, further comprising means for ordering the set of rules based on historic capability data for product lots processed with each rule.

[c25]   25. The program product of claim 23, further comprising means for ordering the set of rules in real time by evaluating capability data for each rule using metrology data.

[c26]   26. The program product of claim 21, wherein the sampling rate is determined from a capability ratio Cpk calculated based on the selected rule